Research Article

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ASSESSMENT OF THE SIGNIFICANCE OF MURCHANA SAMSKARA OF GHRITA BY GC-MS

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Received on: 25/04/17 Accepted on: 30/05/17

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DOI: 10.7897/2277-4343.082105

ABSTRACT

Murchana Samskara (processing of ghee) is mentioned in Bhaishajya Ratnavali for both Taila (oil) and Ghrita Kalpana (ghee formulations) to reduce Amadosa, Durgandhata (bad odour) etc. Dosha (impurities) and to enhance the Viryata (potency) of Sneha (lipid). Physico-chemical analysis of Murchita Ghrita (processed ghee) sample has shown increase in the specific gravity, saponification value, Iodine value, Ester value, total fatty acids and decrease in acid value, viscosity, Density etc. Murchana process imparts changes in good colour, odour, minimizing rancidity & increasing stability facilitates better dissolution of bio constituents in Ghrita (ghee). So, to evaluate the changes after Murchana with advanced method GC-MS study. The samples of Amurchita (plain ghee) and Murchita Ghrita (processed ghee) were subjected for analysis. In GC-MS study Ghrita (ghee) sample shown increase in number of unsaturated fatty acids like oleic acid, gondoic acid**,** 9,12-Octadecadienoic acid (Z,Z) methyl ester etc may contribute increase in HDL Cholesterol and decrease in LDL Cholesterol. Other effects of Murchana Samskara (processing of ghee) are beneficial in decreasing risk of developing cardiovascular diseases, advantageous in impact on metabolism, in reducing risk of male infertility & growth retardation and addition of new components.

Keywords; Ghrita (ghee), Ghrita Murchana, Murchita Ghrita (processed ghee), GC-MS

INTRODUCTION

As physico-chemical analysis of Ghrita (ghee) and Murchita Ghrita (processed ghee) shown Murchana Samskara (processing of ghee) is beneficial in stability of physical, chemical & therapeutical properties. So an attempt was made to evaluate further changes in the Murchita Ghrita (processed ghee) sample by advanced instruments like GCMS in this study.

Gas Chromatography–Mass Spectrometry (GC-MS); Gas chromatography (GC) is a widely applied technique in many branches of science and technology. For over half a century, GC has played a fundamental role in determining how many components and in what proportion they exist in a mixture. However, the ability to establish the nature and chemical structure of these separated and quantified compounds is ambiguous and reduced, and requires a spectroscopic detection system. The most used, is the mass spectrometric detector (MSD), which allows obtaining the "fingerprint" of the molecule, i.e., its mass spectrum. Mass spectra provide information on the molecular weight, elemental composition, if a high resolution mass spectrometer is used, functional groups present, and, in some cases, the geometry and spatial isomerism of the molecule[1].

General uses: a) Identification and quantitation of volatile and semi volatile organic compounds in complex mixtures. b) Determination of molecular weights and elemental compositions of unknown organic compounds in complex mixtures. c) Structural determination of unknown organic compounds in complex mixtures both by matching their spectra with reference spectra and by a prior spectral interpretation.

Aims & objectives

- To analyse the changes in terms fatty acids in Murchita Ghrita (processed ghee) by GC-MS
- To provide additional evidence by comparing the GC-MS results of Amurchita Ghrita (ghee) and Murchita Ghrita (processed ghee)

MATERIALS AND METHODS

Raw drugs required for the Murchana of Ghrita (processing of ghee) were collected from the Teaching pharmacy of S.D.M. College of Ayurveda, Hassan. Ghrita Murchana (processing of ghee) was conducted at Rasashastra and Bhaishajya Kalpana practical laboratory, S.D.M. College of Ayurveda, Hassan as per the reference of Bhaishajya Ratnavali[2]. Chromatographical study was conducted at Bureau Veritas, Chennai

Method of sample preparation for GCMS analysis[3]

Esterification: 0.2 g of sample is taken in 50 ml of F.B Flask. Then added 2.4 ml of methanolic-HCl and 12 ml of methanol. Reflux it for 1 hour at 100^0 C. Then check the TLC for the completion of the reaction and reaction mixture was extracted with hexane. Hexane layer was taken, dried it at room temperature and sample given for GC-MS analysis

OBSERVATIONS AND RESULTS

Table 1: Components of Ghrita (ghee) samples

Components	Ghrita (ghee)	Murchita Ghrita (processed ghee)
Alcohol	**3**	**3**
Ester	**13**	**11**
Ether	**0**	**0**
Ketone	**0**	**0**
Saturated fatty acids	**49**	**45**
Unsaturated fatty acids	**18**	**25**
Total	**83**	**84**

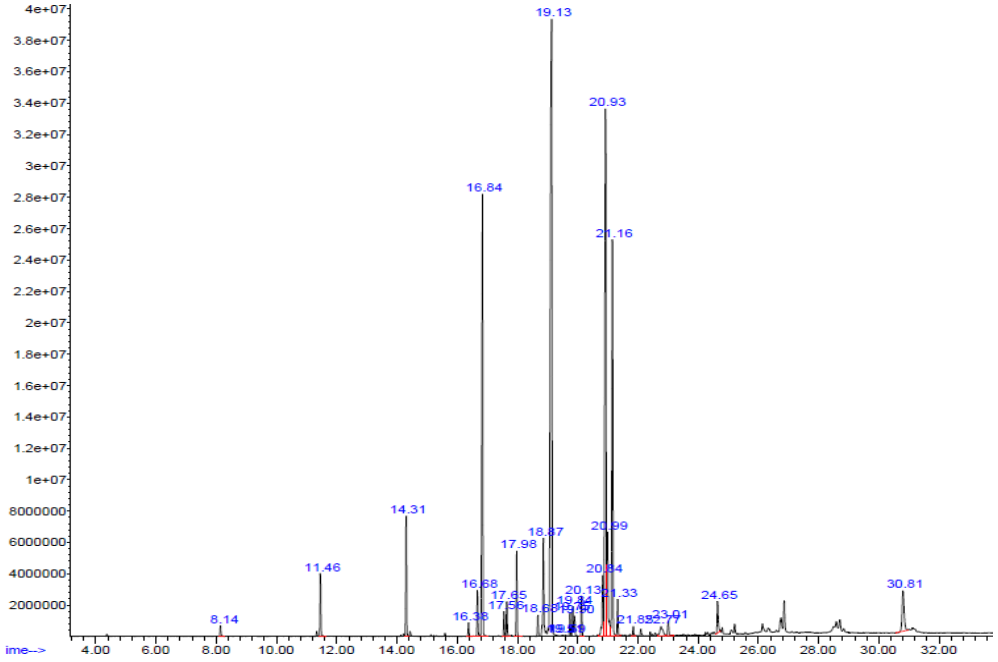

Figure 1: Spectrum of Ghrita (Ghee)

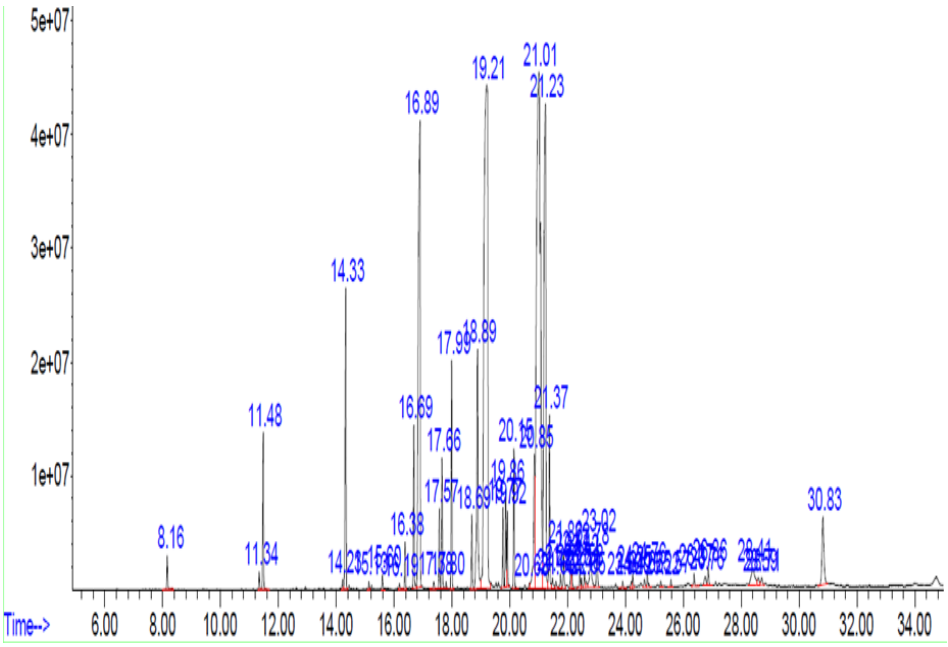

Figure 2: Spectrum of Murchita Ghrita (Processed Ghee)

Table 2: Numbers of major components detected in Ghrita (ghee) samples by GCMS report

Sl no	Components		Type of fatty acid	Ghrita (ghee)	Murchita Ghrita (processed ghee)
	Systematic name	**Common name**			
1.	Decanoic acid, methyl ester	Capric	saturated	3	3
2.	Dodecanoic acid, methyl ester	Lauric	saturated	2	2
3.	Hexadecanoic acid, methyl ester	Palmitic	saturated	4	4
4.	Heptadecanoic acid, methyl ester	margaric	saturated	3	3
5.	Eicosanoic acid, methyl ester	arachidic	saturated	2	2
6.	Cis-11-Eicosenoic acid, methyl ester	Gondoic[9]	unsaturated	1	2
7.	9,12-Octadecadienoic acid (Z,Z) methyl ester	linoleic	unsaturated	1	1
8.	9-Octadecenoic acid, methyl ester, (E)-	oleic	unsaturated	3	2
9.	9-Octadecenoic acid (Z)-, methyl ester	oleic	unsaturated	1	2
10.	8-Octadecenoic acid, methyl ester		unsaturated	0	1
11.	9-octadecenoic acid,12-hydroxy-methyl ester,{R-(Z)}-	oleic	unsaturated	0	0

Ghrita (ghee) SFA-14 USFA -6
Murchita Ghrita (processed ghee) SFA-14 USFA -7

DISCUSSION

GCMS analysis of both samples reveals that 3 alcohol compounds detected in Ghrita (ghee) and Murchita Ghrita (processed ghee). It suggests that there is no change in alcohol components after Murchana Samskara (processing of ghee) in case of Ghrita (ghee). 13 esters are detected each in Ghrita (ghee) & 11 in Murchita Ghrita (processed ghee). There is decrease in the ester components in case of Ghrita (ghee) after Murchana Samskara (processing of ghee) 49 saturated fatty acids are detected in Ghrita (ghee), 45 in Murchita Ghrita (processed ghee). Saturated fatty acids are decreased in case of after Murchana Samskara (processing of ghee) Saturated fats increase Low Density Lipoproteins (LDL or bad cholesterol) & Very Low Density Lipoproteins (VLDL's).So Murchana Samskara(processing of ghee) is proved beneficial therapeutically.

Table 2 reveals that Decanoic acid remains same in number in both Ghrita (ghee) samples. Decanoic acid, also known as "Capric acid," occurs naturally in coconut oil and palm kernel oil, as well as in the milk and animal fats of some mammals[4]. According to study results published in 1998 in the "American Journal of Clinical Nutrition." Capric acid — together with lauric acid and caprylic acid, other medium-chain fatty acids — helps to increase levels of high-density lipoproteins HDL, the "good" cholesterol — relative to low-density lipoproteins — LDL, the "bad" cholesterol.

Dodecanoic acid, methyl ester which is known as **Lauric acid**[5] is increased in area% after Murchana Samskara (processing of ghee).

Lauric acid, as a component of triglycerides, comprises about half of the fatty acid content in coconut oil, laurel oil, and palm kernel oil (not to be confused with palm oil), Otherwise, it is relatively uncommon. It is also found in human breast milk (6.2% of total fat), cow's milk (2.9%), and goat's milk (3.1%).

Lauric acid increases total serum cholesterol more than many other fatty acids. But most of the increase is attributable to an increase in high-density lipoprotein (HDL) (the "good" blood cholesterol). As a result, lauric acid has been characterized as having "a more favorable effect on total HDL cholesterol than any other fatty acid.

Table 2 shows that **Palmitic acid** ie Hexadecanoic acid**,** methyl ester is decreased area% wise after Murchana Samskara (processing of ghee). According to the World Health Organization, evidence is "convincing" that consumption of palmitic acid increases risk of developing cardiovascular diseases[6].

Heptadecanoic acid is remaining same in number in case of Ghrita (ghee) when prepared with Murchita Ghrita (processed ghee). In area% it is increased in case of Ghrita (ghee) when Murchana Samskara (processing of ghee) is done. Heptadecanoic acid or margaric acid, is a fatty acid found in dairy fat, rye, and some fish and could help in the early stages of diabetes in humans.

Recent studies on dolphins shows that, among 55 fatty acids studied, saturated fat heptadecanoic acid having most beneficial effect on metabolism.

Cis-11-Eicosenoic acid, methyl ester which is known as **gondoic acid** is increased after Murchana Samskara (processing of ghee). Gondoic acid is a monounsaturated[6] omega-9 fatty acid found in a variety of plant oils and nuts.

Omega 9 fatty acids are included in animal fat and vegetable oil, and they are one of the most important sources of Omega 9. Deficiency of these omega 9 fatty acids leads to irregular heartbeat, male infertility and growth retardation.

9-Octadecenoic acid, methyl esters are also called as **oleic acid** are increased after Murchana Samskara (processing of ghee).

Oleic acid is a fatty acid that occurs naturally in various animal and vegetable fats and oils. In chemical terms and is classified as a monounsaturated omega-9 fatty-acid[7].

Monounsaturated fat consumption has been associated with decreased low-density lipoprotein (LDL) cholesterol, and possibly increased high-density lipoprotein (HDL) cholesterol[8].
18 unsaturated fatty acids detected in Ghrita (ghee), 25 in Murchita Ghrita (processed ghee). Unsaturated fatty acids are increased after Murchana Samskara (processing of ghee).

Unsaturated fats increase High-Density Lipoprotein (HDL or good cholesterol) and decrease Low Density Lipoproteins (LDL or bad cholesterol)[9, 10].

It shows that Murchana Samskara (processing of ghee) proved beneficial in Ghrita (ghee).

Total 83 numbers of components are detected in Ghrita (ghee), 84 in Murchita Ghrita (processed ghee). Number of components is increased after Murchana Samskara (processing of ghee).

CONCLUSION

From GCMS analysis of Ghrita (ghee) samples it is revealed that Increased **Dodecanoic acid, methyl ester** which is known as **Lauric acid** by area% in Murchita Ghrita (processed ghee) may be beneficial in increasing HDL cholesterol. Decreased **Palmitic acid** which is known as **Hexadecanoic acid, methyl ester** in Murchita Ghrita (processed ghee) may be beneficial in decreasing risk of developing cardiovascular diseases. **Increased Cis-11-Eicosenoic acid, methyl ester** which known as **gondoic acid** after Murchana Samskara (processing of ghee) in case of Ghrita (ghee) may be beneficial in reducing risk of male infertility and growth retardation. Increased number of **9-Octadecenoic acid, methyl esters** which are also called as **oleic acid** in Murchita Ghrita (processed ghee) may be advantageous in decreasing LDL and increasing HDL cholesterol. Increased **unsaturated fatty acids** in Murchita Ghrita (processed ghee) suggests that Murchana Samskara (processing of ghee) is may be benficial to human health by increasing the HDL. Increased number of fatty acids in Murchita Ghrita (processed ghee) indicates the addition of new components. After Murchana Samskara (processing of ghee), Ghrita (ghee) contains most of the beneficial unsaturated fatty acids. Hence it is expected to contribute in reducing cholesterol, LDL, Triglycerides and increase of HDL level.

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Cite this article as:

Vinay R. Kadibagil and R. S. Sarashetti. Assessment of the significance of murchana samskara of ghrita by GC-MS. Int. J. Res. Ayurveda Pharm. 2017;8(Suppl 2):166-169 http://dx.doi.org/10.7897/2277-4343.082105

Source of support: Nil, Conflict of interest: None Declared